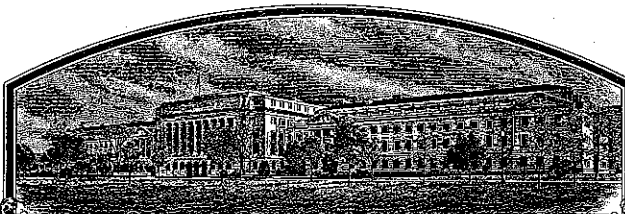


No.

200500013



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Texas Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMERICAL GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Sturdy 2K'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty-fifth day of March, in the year two thousand and five.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture



APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

(See reverse for instructions and information collection burden statement)

Exhibit A

Origin and Breeding History

Sturdy 2K (experimental designation TX391-56-D1-23-D19-7 or Sturdy selection D19-7) is an awned, semidwarf, hard red winter wheat (*Triticum aestivum* L.) with white chaff. Sturdy 2K is a medium maturing wheat with good grain and forage yield potential, durable resistance to leaf rust, strong straw, and good hard red winter wheat quality. Sturdy 2K is best adapted to the central and north-central Texas Blacklands, and has performed well in the other major wheat producing areas of Texas.

In the fall of 1966, foundation seed of the hard red winter wheat cultivar 'Sturdy' (CItr13684) was released by the Texas Agricultural Experiment Station (TAES) for production to registered and certified seed growers in Texas. Sturdy was the first semidwarf hard red winter wheat available for production in the United States. In addition to its short stature and resistance to lodging, Sturdy was resistant to leaf rust (caused by *Puccinia triticina* Eriks.), and had excellent baking quality. The pedigree of Sturdy is Sinvalocho/Wichita//Hope/Cheyenne/3/Wichita/4/Seu Seun 27. I. M. Atkins made the final cross in 1951. In 1961, K. B. Porter made the selection TX391-56-D1-23, which became Sturdy.

From the time of its release, many researchers and producers noticed the leaf rust severity on Sturdy was typically low-to-moderate, and the pustules were smaller and less numerous than on susceptible cultivars. Based on a comparison of leaf rust assessments in standard yield trials under many environmental conditions and numerous locations in Texas, the low reaction of Sturdy to leaf rust has been consistent for the period of 1966 to 2000, a period of 34 years (Marshall, unpublished data). During this time, many other wheat cultivars were released having complete resistance to leaf rust, but then rapidly succumbing to newly selected races, resulting in complete susceptibility of the cultivar in a very short period of time (often only 2-to-3 years). Thus by definition, the leaf rust resistance in Sturdy is durable (Roelfs 1988). The resistance in Sturdy was determined to be due to the genes *Lr12* and *Lr34* (Dyck 1991). Both of these genes are best expressed in adult plants, typically after the jointing stage. However, *Lr34* can also be expressed in seedlings and juvenile plants, particularly under cool temperatures (less than 15°C). The gene *Lr34* has been implicated as being truly race non-specific, meaning that all races of *P. triticina* react in a similar, low reaction (moderately resistant) to *Lr34*. CIMMYT found that *Lr34* has been durably resistant on a worldwide basis for over 30 years, and has bred the gene into many spring wheat cultivars (Sayre, et al. 1998). In addition, *Lr34* has been found to enhance the effective resistance of other *Lr* genes when present in combination (German and Kolmer 1992). The gene *Lr34* is genetically linked to a gene for leaf tip necrosis, which serves as a useful morphological marker, yet does not unduly harm the plant (Singh 1992).

In 1991 at TAES-Prosper, D. Marshall observed that some plants in Sturdy had smaller and fewer pustules than other plants. Heads from plants with different reaction types were individually selected for leaf rust evaluations (Table 1). The plants were separated into three types based on differential reactions to *P. triticina* pathotypes. Approximately 40% of the plants from Sturdy exhibited identical reactions to Selection D3-13, indicating the presence of *Lr10* and *Lr12*. Another 20% reacted identical to Selection D12-2, indicating the presence of *Lr10* and *Lr34* in those selections. The remaining 40% of the plants reacted identical to Selection D19-7, indicating the presence of *Lr10*, *Lr12*, and *Lr34*. The *Lr* genes could be postulated based on the

pathotypes used in conjunction with the known tester lines, Chinese Spring (*Lr12* and *Lr34*), RL6004 (*Lr10*), RL6011 (*Lr12*), and RL6058 (*Lr34*) (Table 1). The pathotypes were selected based on their virulence/avirulence to *Lr10*, as well as their relative avirulence to other known seedling genes (pathotype BBB) or their relative virulence to different seedling genes (pathotypes MBG and TBD).

The selections and tester lines were also tested as adult plants under both controlled conditions and in the field at Dallas and Prosper (Table 2). It was clear that the presence of *Lr10* by itself (RL6004) offers little protection from field populations of *P. triticina* and that the addition of the adult plant gene *Lr12* has little effect. However, *Lr34* alone and particularly in combination with *Lr12* and *Lr10*, as in Selection D19-7, was highly effective in minimizing leaf rust. In the field, leaf tip necrosis was evident in Sturdy, Selection D12-2, Selection D19-7, Chinese Spring, and RL6058.

The selection, TX391-56-D1-23-D19-7 (Sturdy selection D19-7) was increased at Prosper, Texas, from 1992-1999. Beginning in the 1999-2000 growing season, Sturdy selection D19-7 was designated 'Sturdy 2K' (abbreviation for Sturdy 2000) and substituted for Sturdy in the North Texas Wheat Elite Trial. Sturdy 2K was grown in a 1 acre increase block at Prosper in 2000-2001. Sturdy 2K was increased in Vernon, TX in the 2001-02 and 2002-03 growing seasons.

Sturdy 2K has been observed for 9 generations during testing and seed increase, and is stable and uniform. No variants have been observed.

Exhibit B

Statement of Distinctness

Sturdy 2K (experimental designation TX391-56-D1-23-D19-7 or Sturdy selection D19-7) is an awned, semidwarf, hard red winter wheat (*Triticum aestivum* L.) with white chaff. Sturdy 2K is a medium maturing wheat with good grain and forage yield potential, durable resistance to leaf rust, strong straw, resistance to shattering, and good hard red winter wheat quality. Sturdy 2K is best adapted to the central and north-central Texas Blacklands, and has performed well in the other major wheat producing areas of Texas.

Sturdy 2K is most similar to Sturdy, a variety that was heterogenous for its reaction to leaf rust (caused by *Puccinia triticina*) when it was released by TAES in 1966. Approximately 40% of the plants in Sturdy have the genes *Lr10*, *Lr12*, and *Lr34*. Another 40% of the plants have only the genes *Lr10* and *Lr12*. The remaining 20% have only the genes *Lr10* and *Lr34*. Sturdy 2K is a selection (Sel. D19-7) of one of the plants that contains all three genes, *Lr10*, *Lr12*, and *Lr34*. Sturdy 2K is more resistant, and displays lower severity under field conditions, than Sturdy (Tables 1 and 2).

Leaf rust data from the North Texas Wheat Elite Trial from 1998-99 and 1999-2000 indicated the low severity and resistant-to-moderately resistant reaction type of Sturdy 2K as compared to the standard check cultivars (Table 3). The severity and reaction type of Sturdy 2K to stripe rust (caused by *Puccinia striiformis* Eriks.) was resistant in 1999-2000 and moderately resistant in 2000-01. This reaction to stripe rust is significant because the race change in *P. striiformis* in the southern Great Plains between the 2000 and 2001 harvest years resulted in several other cultivars changing from a resistant or moderately resistant reaction to a reaction of complete susceptibility (such as 2180, TAM 110, TAM 202, and TAM 302) (Table 3). The reaction of Sturdy 2K and the standard, check cultivars to barley yellow dwarf virus (BYDV) were statistically the same (Table 3). Scoring BYDV under field conditions is associated with a high level of variability due to the uneven distribution of the aphid vectors in the field. Freeze damage was significant enough to be rated only in the 2001-02 growing season. In that year at the Era, Italy, and Prosper locations, Sturdy 2K had minimal damage to freeze, similar to the other standard cultivars and significantly better than TAM 110.

References

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- Long, D. L., and J. A. Kolmer. 1989. A North American system of nomenclature for *Puccinia recondita* f.sp. *tritici*. *Phytopathology* 79:525-529.
- Roelfs, A. P. 1988. Resistance to leaf and stem rusts in wheat. In *Breeding strategies for resistance to the rusts of wheat*, edited by N. W. Simmonds and S. Rajaram. Mexico City: CIMMYT.
- Sayre, K. D., R. P. Singh, J. Huerta-Espino, and S. Rajaram. 1998. Genetic Progress in Reducing Losses to Leaf Rust in Cimmyt-Derived Mexican Spring Wheat Cultivars. *Crop Science* 38 (3):654-659.
- Singh, R. P. 1992. Association between gene *Lr34* for leaf rust resistance and leaf tip necrosis in wheat. *Crop Science* 32:874-878.

Table 1. Seedling reactions of Sturdy, Sturdy selections, and selected tester lines with known *Lr* genes inoculated with 6 pathotypes of *Puccinia triticina* at 23-25°C and 3 pathotypes at 12-15°C; and postulated *Lr* genes.

Line	Pathotype 23-25°C						Pathotype 12-15°C			<i>Lr</i> genes
	BBB ^a	BBB-10	MBG	MBG-10	TBD	TBD-10	BBB	BBB-10	TBD	
Sturdy	X1-3 ^b	X3-3+	X1-3	X3-3+	X1-3	X3-3+	X;-3	X;-3+	X;-3+	X 10, 12, 34
Sel.D3-13	1+	3+	1+	3+	1+	3+	1+	3+	1+	10, 12
Sel.D12-2	1-	3-	1-	3-	1-	3-	;1-	;3-	;1-	10, 34
Sel.D19-7	1-	3-	1-	3-	1-	3-	;1-	;3-	;1-	10, 12, 34
Chinese Spring	3-	3-	3-	3-	3-	3-	;3-	;3-	;3-	12, 34
RL6004	1+	3+	1+	3+	1+	3+	1+	3+	1+	10
RL6011	3	3+	3	3+	3	3+	;3	3+	;3	12
RL6058	3	3+	3	3+	3	3+	;3	;3-	;3	34

^a The pathotypes had specific virulence to the following seedling *Lr* genes: BBB – none; BBB-10 – *Lr*10; MBG – *Lr*1, 3, and 11; MBG-10 – *Lr*1, 3, 10, and 11; TBD – *Lr*1, 2a, 2c, 3, and 17; TBD-10 – *Lr*1, 2a, 2c, 3, 10, and 17 (Long and Kolmer 1989).

^b Leaf rust reactions were: 'X' = Plants had variable reactions; some with the low reaction and others with the high reaction. '1' = Resistant reaction, minute pustules, typically surrounded with necrosis. '3' = Susceptible reaction, large pustules with or without surrounding chlorosis. ';' = Resistant reaction, no pustules, only a chlorotic or necrotic fleck. A '-' or a '+' represents a lesser or greater response of the indicated reaction. When two reaction types occurred on the same leaf, both reactions are listed, with the most common reaction first; for example, ';3' means that most of the reactions on the leaf were resistant flecks, however some susceptible pustules were also present.

Table 2. Adult plant (flag leaf) reactions of Sturdy, Sturdy selections, and selected tester lines with known *Lr* genes inoculated with 6 pathotypes of *Puccinia triticina* and field reactions at the soft dough development stage.

Line	Pathotype at 23-25°C		1999		2000	
	BBB ^a	BBB-10	Dallas	Prosper	Dallas	Prosper
Sturdy	X;-3 ^b	X3-3+	10MR-MS ^c	15MR-MS	5MR-MS	10MR-MS
Sel.D3-13	;1	3-	50MS-S	60MS-S	50MS-S	50MS-S
Sel.D12-2	;	2-	30MR	30MR	10MR	15MR
Sel.D19-7	;	;2	1MR-R	5MR-R	1MR-R	1MR-R
Chinese Spring	2-	;2	5MR	5MR	5MR	10MR
RL6004	1+	3+	70S	80S	80S	80S
RL6011	3-	3-	60S	60S	70S	70S
RL6058	2+	2-	20MS-MR	20MS-MR	10MR-MS	20MR-MS

^a The BBB pathotype had specific virulence to none of the genes tested. Pathotype BBB-10 is virulent on *Lr*10.

^b Leaf rust reactions were: 'X' = Plants had variable reactions; some with the low reaction and others with the high reaction. '1' = Resistant reaction, minute pustules, typically surrounded with necrosis. '3' = Susceptible reaction, large pustules with or without surrounding chlorosis. ';' = Resistant reaction, no pustules, only a chlorotic or necrotic fleck. A '-' or a '+' represents a lesser or greater response of the indicated reaction. When two reaction types occurred on the same leaf, both reactions are listed, with the most common reaction first; for example, ';3' means that most of the reactions on the leaf were resistant flecks, however some susceptible pustules were also present.

^c Percent severity in the field at soft dough stage where 'S' = susceptible (large pustules with little or no chlorosis; 'MS' = moderately susceptible (medium-size pustules typically with chlorosis; 'MR' = moderately resistant (small pustules typically with chlorosis or necrosis); and 'R' = resistant (no pustules or minute pustules with necrosis).

Table 3. Leaf rust, stripe rust, barley yellow dwarf virus (BYDV), and freeze damage comparison of Sturdy 2K and standard varieties in the North Texas Elite Trial at Blackland locations^x in the four year period from 1999 to 2002.

	Leaf rust (% and reaction type) ^y		Stripe rust (% and reaction type) ^y		Barley yellow dwarf virus (0-9)			Freeze damage (0-5)
	2 locs	2 locs	2 locs	1 loc	1 loc	2 locs	3 locs	3 locs
<i>Cultivar</i>	98-99	99-00	99-00	00-01	98-99	99-00	Avg	01-02
Sturdy 2K	8MR a	0R a	1R	30MR	3.0	2.6	2.8	1.5 b
2137	50S c	---	---	100S	4.7	---	---	---
2180	35MS b	33S c	10MR	100S	5.0	2.6	3.8	1.9 ab
Coronado	---	---	---	60MS	---	---	---	2.0 ab
Jagger	71S cd	67S d	3MR	1R	4.7	4.0	4.3	1.9 ab
Ogallala	24MS ab	5MS b	1R	40MR	2.7	3.5	3.1	1.9 ab
TAM 110	94S d	93S e	1R	80S	6.0	3.3	4.6	2.4 a
TAM 202	60S c	40S c	4MR	80S	4.7	4.0	4.3	2.2 ab
TAM 302	20MS ab	1MS a	1MR	90S	3.3	2.6	2.9	1.8 ab
TAM 400	---	---	---	100S	---	---	---	2.0 ab
<i>Average</i>	45	30	3.8	68	4.3	3.2	3.7	1.9
<i>LSD (5%)</i>	12.7	8.3	16.8 ns	---	2.7 ns	2.0 ns	2.1 ns	0.7
<i>CV (%)</i>	42.0	23.6	39.7	---	30.7	37.4	28.6	38.1

^x Locations were: Leaf rust: Dallas and Prosper, Texas; Stripe rust 1999-2000: Dallas and Prosper, Texas; Stripe rust 2000-01: Uvalde. BYDV 1998-1999: Dallas; BYDV 1999-2000: Dallas and Prosper, Texas; and Freeze damage 2001-02: Era, Italy, Prosper, Texas. Means within a column having a letter in common are not significantly different at $P=0.05$.

^y For leaf and stripe rust ratings, the number is the percent severity (percent of the flag leaf covered with rust pustules at soft dough stage); and the letter are the reaction type, where R=resistant (no pustules or minute pustules with necrosis); MR=moderately resistant (small pustules, typically with chlorosis or necrosis); MS=moderately susceptible (medium size pustules with or without chlorosis); and S=susceptible (large pustules typically without chlorosis or necrosis).

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY

WHEAT (*Triticum* spp.)

NAME OF APPLICANT(S) Texas Agricultural Experiment Station	FOR OFFICIAL USE ONLY
	PVPO NUMBER 200500013
	VARIETY NAME Sturdy 2K
ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code) Technology Licensing Office Texas A&M University System 310 Wisenbaker College Station, TX 77843-3369	TEMPORARY OR EXPERIMENTAL DESIGNATION TX391-56-D1-23-D19-7

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. or) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designated system used: **Munsell Color Charts 1977**
Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

1

1 = Common

2 = Durum

3 = Club

4 = Other (SPECIFY) _____

2. VERNALIZATION:

2

1 = Spring

2 = Winter

3 = Other (SPECIFY) _____

3. COLEOPTILE ANTHOCYANIN:

1

1 = Absent

2 = Present

4. JUVENILE PLANT GROWTH:

2

1 = Prostrate

2 = Semi-erect

3 = Erect

5. PLANT COLOR (boot stage):

2

1 = Yellow-Green

2 = Green

3 = Blue-Green

6. FLAG LEAF (boot stage):

2

1 = Erect 2 = Recurved

1

1 = Not Twisted

2 = Twisted

7. EAR EMERGENCE:

0

2

Number of Days Earlier Than **TAM 302**

0

6

Number of Days Later Than **(Pioneer) 2180**

8. ANTHER COLOR:

1

1 = Yellow

2 = Green

9. PLANT HEIGHT (from soil to top of head, excluding awns):

0

7

cm Taller Than **(Pioneer) 2180**

0

1

cm Shorter Than **Ogallala**

10. STEM:

A. ANTHOCYANIN

1 1 = Absent 2 = Present

B. WAXY BLOOM

1 1 = Absent 2 = Present

C. HAIRINESS (last internode of rachis)

1 1 = Absent 2 = Present

D. INTERNODE (SPECIFY NUMBER) First below peduncle

1 1 = Hollow 2 = Semi-solid 3 = Solid

E. PEDUNCLE

2 1 = Absent 2 = Present

13 cm Length

11. HEAD (at Maturity):

A. DENSITY

2 1 = Lax 2 = Middense 3 = Dense

B. SHAPE

1 1 = Tapering 2 = Strap 3 = Clavate 4 = Other (SPECIFY) _____

C. CURVATURE

1 1 = Erect 2 = Inclined 3 = Recurved

D. AWNEDNESS

4 1 = Awnless 2 = Apically Awnletted 3 = Awnletted 4 = Awned

12. GLUMES (at Maturity):

A. COLOR

1 1 = White 2 = Tan 3 = Other (SPECIFY) _____

B. SHOULDER

1 1 = Wanting 2 = Oblique 3 = Rounded 4 = Square 5 = Elevated 6 = Apiculate

C. BEAK

1 1 = Obtuse 2 = Acute 3 = Acuminate

D. LENGTH

2 1 = Short (ca. 7mm) 2 = Medium (ca. 8mm) 3 = Long (ca. 9mm)

E. WIDTH

2 1 = Narrow (ca. 3mm) 2 = Medium (ca. 3.5mm) 3 = Wide (ca. 4mm)

13. SEED:

A. SHAPE

3 1 = Ovate 2 = Oval 3 = Elliptical

B. CHEEK

1 1 = Rounded 2 = Angular

C. BRUSH

2 1 = Short 2 = Medium 3 = Long **1** 1 = Not Collared 2 = Collared

D. CREASE

2 1 = Width 60% or less of Kernel
2 = Width 80% or less of Kernel
3 = Width Nearly as Wide as Kernel

1 1 = Depth 20% or less of Kernel
35% or less of Kernel
3 = Depth 50% or less of Kernel

13. SEED: (continued)

E. COLOR

3

1 = White

2 = Amber

3 = Red

4 = Other (SPECIFY) _____

F. TEXTURE

1

1 = Hard

2 = Soft

F. PHENOL REACTION (see instructions) **NOT DETERMINED****0**

1 = Ivory

2 = Fawn

3 = Light Brown

4 = Dark Brown

5 = Black

14. DISEASE:

(0=Not Tested;

1=Susceptible;

2=Resistant;

3=Intermediate;

4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

Stem Rust (*Puccinia graminis* f. sp. *tritici*)**0**Stripe Rust (*Puccinia striiformis*)**2**Tan Spot (*Pyrenophora tritici-repentis*)**0**Halo Spot (*Selenophoma donacis*)**0**Glume Blotch (*Septoria nodorum*)**0**Speckled Leaf Disease (*Septoria avenae*)**0**Speckled Leaf Blotch (*Septoria tritici*)**1**Scab (*Fusarium* spp.)**0**

Black Point (Kernel Smudge)

0

Barley Yellow Dwarf Virus (BYDV)

3

Soilborne Mosaic Virus (SBMV)

0

Wheat Yellow (Spindle Streak) Mosaic Virus

0

Wheat Streak Mosaic Virus (WSMV)

0

Other (SPECIFY)

0Leaf Rust (*Puccinia recondita* f. sp. *tritici*)**2****MBG and TDB**Loose Smut (*Ustilago tritici*)**0**Flag Smut (*Urocystis agropyri*)**0**Common Bunt (*Tilletia tritici* or *T. laevis*)**0**Dwarf Bunt (*Tilletia controversa*)**0**Karnal Bunt (*Tilletia indica*)**0**Powdery Mildew (*Erysiphe graminis* f. sp. *tritici*)**0**

Snow Molds

0Common Root Rot (*Fusarium*, *Cochliobolus* and *Bipolaris* spp.)**0**Rhizoctonia Root Rot (*Rhizoctonia solani*)**0**Black Chaff (*Xanthomonas campestris* pv. *translucens*)**0**Bacterial Leaf Blight (*Pseudomonas syringae* pv. *syringae*)**0**

Other (SPECIFY)

0

Other (SPECIFY)

0

Other (SPECIFY)

Other (SPECIFY)

200500013

Exhibit C (Wheat) Page 4

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)
PLEASE SPECIFY BIOTYPE (where needed)

Hessian Fly (*Mayetiola destructor*)

☒ 0

Other (SPECIFY)

☐

Stem Sawfly (*Cephus spp.*)

☒ 0

Other (SPECIFY)

☐

Cereal Leaf Beetle (*Oulema melanopa*)

☒ 0

Other (SPECIFY)

☐

Russian aphid (*Diuraphis noxia*)

☒ 0

Other (SPECIFY)

☐

Greenbug (*Schizaphis graminum*)

☒ 0

Other (SPECIFY)

☐

Aphids

☒ 0

Other (SPECIFY)

☐

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS:

For additional information concerning Sturdy 2K, please see the release proposal from the Texas Agricultural Experiment Station given as Exhibit D.

Exhibit D

Additional Description of Variety

Yield: In the North Texas Wheat Elite Trial for the 4-year period from harvest years 1999 through 2002, Sturdy 2K had an average yield of 55.7 bu/acre, which was 1.3 bu/acre higher than '2180', 3.0 higher than 'TAM 302', 4.8 higher than 'Ogallala', 5.9 higher than 'Jagger', 8.5 higher than 'TAM 110', and 9.0 higher than 'TAM 202' (Table 4). The test weight of Sturdy 2K averaged 57.1 lb/bu, which was 0.8 lb/bu less than Ogallala, but at least 0.5 lb/bu greater than the other standard, check cultivars (Table 4).

Plant Characteristics: Over 15 location-years in the Texas Blacklands from the harvest years 1999 through 2002, the average heading date of Sturdy 2K was 104 days from January 1 (Table 5). This was the same approximate heading date as TAM 202. Sturdy 2K was six days later in heading than 2180 and Jagger; two days earlier than TAM 302, and four days earlier than Ogallala. Sturdy 2K has averaged 36 inches in height, about the same as Jagger, Ogallala, TAM 110, TAM 202, and TAM 302, and about 3 inches taller than 2180 (Table 5). Over the 15 location-years of testing, lodging data were taken only at Prosper in 1999-2000. The lodging score for Sturdy 2K was 1.0 (very slight leaning) out of a possible 9.0, where 0.0 represented no lodging, and 9.0 represented completely flatten plants. Sturdy 2K had significantly better lodging resistance than Jagger (Table 5).

In 2001-02, forage production of Sturdy 2K was compared to several soft red winter wheat cultivars (Table 6). The total dry matter yield of Sturdy 2K was statistically equivalent to the cultivars 'Roane', 'Shelby', 'Pioneer 25R57', and 'Coker 9803', and slightly less than 'Sisson' (Table 6).

Milling and Mixing Data: In the original release pamphlet of Sturdy in April 1967, it was stated, "Grain of Sturdy from many locations and from both irrigated and dryland production has been extensively tested for quality. In all instances, Sturdy has been equal to the best quality hard red winter wheat varieties. Flour yield, gluten strength and bread characteristics of Sturdy were outstanding in all tests." Once we recognized that Sturdy 2K had the potential to be a new cultivar, we tested its grain for hard red winter wheat quality in the 2000 harvest year by milling and mixograph comparison to TAM 302 and the long term quality check, 'TAM W-101' (Table 7). Those data indicated Sturdy 2K had comparable milling and mixing qualities to the two checks. In the 2001 harvest year, the milling and mixing data of indicated that Sturdy 2K had a higher flour yield than all the other check cultivars, as well as having protein and water absorption characteristics indicative of a good quality hard red winter wheat (Table 8). The hardness index of Sturdy 2K (via the Single Kernel Hardness Classification system) showed that the cultivar has good, hard kernels (Table 8).

A complete milling and baking analysis (USDA/ARS Wheat Quality Lab, Manhattan, KS) of Sturdy 2K grain was also conducted in the 2001 harvest year, using Jagger, Ogallala, and TAM W-101 as check cultivars. The test weights of all the wheat cultivars were somewhat low that year, however, the kernel sizing of Sturdy 2K indicated most of the kernels were large or medium sized (Table 10). The hardness scores indicated that Sturdy 2K had good, hard kernels, with a protein content of 11.0%. Sturdy 2K had an acceptable milling score, similar to TAM W-

101, and had good flour color (Table 11). The mixing time of Sturdy 2K was somewhat low, but satisfactory, with the bread having good crumb grain and loaf volume (Table 12).

In the 2002 harvest year, the quality of Sturdy 2K was tested in comparison to 2137, Coronado, and Jagger on grain that was grown and grain harvested in Plymouth, NC in order to test the adaptedness of these cultivars to eastern U.S. environmental conditions. The data from the USDA/ARS Wheat Quality Lab, Manhattan, KS indicated that Sturdy 2K had an acceptable test weight in comparison to the checks, and very good kernel hardness scores. The protein content of grain and flour of Sturdy 2K was good, with a good mixing time, and dough characteristics, crumb grain, and loaf volume consistent with a good quality hard red winter wheat (Tables 13-15).

Table 4. Yield and test weight comparison of Sturdy 2K and standard varieties in the North Texas Elite Trial at Blackland locations^x in the four year period from 1999 to 2002.

<i>Cultivar</i>	<i>Yield (bushels/acre)</i>					<i>Test weight (pounds/bushel)</i>				
	<i>4 locs^x 98-99</i>	<i>4 locs 99-00</i>	<i>4 locs 00-01</i>	<i>3 locs 01-02</i>	<i>15 locs Avg</i>	<i>3 locs 98-99</i>	<i>4 locs 99-00</i>	<i>4 locs 00-01</i>	<i>3 locs 01-02</i>	<i>14 locs Avg</i>
Sturdy 2K	54.7 ab	54.8 a	56.6 a	56.9 a	55.7 a	56.5 ab	56.5ab	59.1a	56.1ab	57.1 a
2137	54.5 ab	----	47.8abc	----	----	56.9 a	----	57.8a	----	----
2180	55.0 ab	54.2 a	50.9abc	57.5 a	54.4 a	56.4 ab	55.3bc	58.7a	56.2ab	56.6 ab
Coronado	----	----	50.0 ab	49.8 ab	----	----	----	59.3a	56.5ab	----
Jagger	46.8 bc	52.4 ab	52.6 ab	47.4 b	49.8 ab	55.1 bc	54.7cd	57.9a	54.5b	55.5 bc
Ogallala	56.5 a	53.4 a	41.9 d	51.9 ab	50.9 ab	57.3 a	57.1 c	59.4a	57.8a	57.9 a
TAM 110	41.9 c	42.7 c	51.9 ab	52.2 ab	47.2 b	53.0 c	53.1de	58.3a	56.5ab	55.2 c
TAM 202	50.4 ab	47.4 bc	44.1 cd	44.8 b	46.7 b	54.5 bc	52.9 d	58.1a	55.6ab	55.3 c
TAM 302	57.3 a	56.1 a	48.0abc	49.4 ab	52.7 ab	55.0 bc	53.7de	55.3b	55.5ab	54.9 c
TAM 400	----	----	48.4abc	42.4 c	----	----	----	61.3a	55.8ab	----
<i>Average</i>	52.1	51.6	49.2	50.2	51.0	55.6	54.7	58.5	56.0	56.1
<i>LSD (5%)</i>	8.2	5.8	6.8	9.4	6.4	2.1	1.7	1.6	2.4	1.4
<i>CV (%)</i>	14.2	11.8	14.7	11.6	9.6	3.1	3.9	4.1	2.9	3.3

^x Locations were: 1998-99: Dallas, Direct, Era, and Prosper, Texas; 1999-2000 and 2000-01: Dallas, Era, Howe, and Prosper, Texas; and 2001-02: Era, Italy, and Prosper, Texas. Means within a column having a letter in common are not significantly different at $P=0.05$.

Table 5. Heading date, height, and lodging comparison of Sturdy 2K and standard varieties in the North Texas Elite Trial at Blackland locations^x in the four year period from 1999 to 2002.

<i>Cultivar</i>	<i>Heading date (days from 1 January)</i>					<i>Height (inches)</i>				<i>Lodging (0-9)</i>
	<i>4 locs^x 98-99</i>	<i>4 locs 99-00</i>	<i>4 locs 00-01</i>	<i>3 locs 01-02</i>	<i>15 locs Avg</i>	<i>1 loc 98-99</i>	<i>1 loc 99-00</i>	<i>3 locs 00-01</i>	<i>5 locs Avg</i>	<i>Prosper 99-00</i>
Sturdy 2K	99 ab	98 b	112 c	108 ab	104 bc	38 a	41	31 a	36 a	1.0 bc
2137	101 ab	---	113 b	---	---	37 a	--	30 a	--	---
2180	90 d	89 de	108 d	104 c	98 d	34 b	38	26 b	33 b	0.0 c
Coronado	---	---	108 d	105 c	---	--	--	27 b	--	---
Jagger	92 cd	88 e	109 d	104 c	98 d	38 a	38	32 a	36 a	5.7 a
Ogallala	102 a	101 a	118 a	110 a	108 a	38 a	41	30 a	36 a	0.0 c
TAM 110	94 c	91 d	109 d	103 c	99 d	36 a	42	31 a	36 a	1.3 bc
TAM 202	99 b	94 c	114 b	108 b	104 bc	36 a	39	30 a	35 a	3.0 b
TAM 302	101 ab	99 ab	116 b	109 ab	106 ab	37 a	38	31 a	35 a	2.0 b
TAM 400	---	---	112 c	107 ab	---	--	--	28 ab	--	---
<i>Average</i>	97	94	112	106	102	37	40	30	35	1.8
<i>LSD (5%)</i>	2.4	1.2	1.8	1.8	2.2	2.4	--	1.4	2.3	2.7
<i>CV (%)</i>	5.7	6.9	5.1	3.8	8.2	6.3	--	9.7	12.3	5.8

^x Locations were: 1998-99: Dallas, Direct, Era, and Prosper, Texas; 1999-2000 and 2000-01: Dallas, Era, Howe, and Prosper, Texas; and 2001-02: Era, Italy, and Prosper, Texas. Means within a column having a letter in common are not significantly different at $P=0.05$.

Table 6. Wheat forage variety test at Overton, Texas for 2001-2002^a.

<i>Cultivar</i>	<i>Harvest 1 Nov 26</i>	<i>Harvest 2 Jan 29</i>	<i>Harvest 3 Mar 28</i>	<i>Harvest 4 Apr 23</i>	<i>Total DMY</i>
	-----pounds of dry matter per acre-----				
Sisson	1772	1312	2546	1607	7236
Roane	1414	863	2699	1792	6768
Shelby	1222	1525	1906	1515	6168
Pioneer P25R57	1254	870	3054	986	6164
Sturdy 2K	1299	1011	2784	811	5906
Coker 9803	1289	1405	1222	1194	5110
<i>Mean</i>	1105	995	2548	1154	5802
<i>CV (%)</i>	42	26	17	56	13
<i>LSD (5%)</i>	420	239	403	NS	710

^a Planted September 12, 2001. Fertilization: Preplant 700 lb 13-13-13/ac. Topdressed with 50 lb N/ac on October 31, 2001, 40 lb N/ac on December 19, 2001, 30 lb N/ac on February 20, 2002, and 42 lb N/ac on April 4, 2002.

Table 7. Milling and mixograph results of Sturdy 2K, TAM W-101, and TAM 302 from a composite grain sample^a of the North Texas Wheat Elite Trial in 1999-2000. Data courtesy of the Cereal Quality Lab, TAMU, College Station, TX.

<i>Cultivar</i>	<i>Flour yield (%)</i>	<i>Flour protein (14% mb)</i>	<i>Flour protein (as is)</i>	<i>Moisture (%)</i>	<i>Water absorption (%)</i>	<i>Midline peak time</i>	<i>Midline peak height</i>	<i>Width at peak</i>
Sturdy 2K	65.73	11.52	10.18	11.61	60.2	3.23	35.1	9.70
TAM 302	67.60	11.48	10.15	11.62	60.2	3.86	25.2	7.60
TAM W-101	61.00	11.54	10.20	11.61	60.2	4.53	29.3	7.70

^a Composite grain from Dallas, Era, Howe, and Prosper, Texas locations.

Table 8. Milling and mixograph results of Sturdy 2K and standard cultivars from a composite grain sample^a in the North Texas Wheat Elite Trial in 2000-01. Data courtesy of the Cereal Quality Lab, TAMU, College Station, TX.

<i>Cultivar</i>	<i>Flour yield (%)</i>	<i>Flour protein (14% mb)</i>	<i>Flour protein (as is)</i>	<i>Moisture (%)</i>	<i>Water absorption (%)</i>	<i>Midline peak time</i>	<i>Midline peak height</i>	<i>Width at peak</i>
Sturdy 2K	72.81	15.05	12.95	13.93	63.0	2.30	44.5	16.3
2137	69.52	14.73	12.69	13.86	62.7	4.24	36.8	12.2
2180	65.74	14.99	12.90	13.92	62.9	4.20	42.0	15.0
Coronado	65.63	15.40	13.27	13.84	63.3	3.35	43.1	19.3
Jagger	65.40	14.79	12.74	13.84	62.7	4.06	39.8	15.8
Ogallala	67.15	15.49	13.36	13.77	63.4	4.24	42.6	14.0
TAM 110	69.05	14.30	12.32	13.86	62.3	5.27	39.5	12.7
TAM 202	69.60	14.53	12.52	13.86	62.5	5.86	36.1	11.3
TAM 302	69.54	14.80	12.75	13.88	62.8	3.46	38.7	17.2
TAM 400	67.04	14.71	12.68	13.81	62.7	5.13	41.5	19.1
TAM W-101	66.00	14.55	12.54	13.81	62.5	3.73	45.6	17.4

^a Composite grain from Dallas, Era, Howe, and Prosper, Texas locations.

Table 9. Single kernel hardness data of Sturdy 2K and standard cultivars from a composite grain sample^a in the North Texas Wheat Elite Trial in 2000-01. Data courtesy of the Cereal Quality Lab, TAMU, College Station, TX.

<i>Cultivar</i>	<i>Hardness index</i>		<i>Grain diameter (mm)</i>		<i>Grain weight (mg)</i>		<i>Hardness Class</i>	<i>Hardness Distribution</i>
	<i>Avg</i>	<i>sd</i>	<i>Avg</i>	<i>sd</i>	<i>Avg</i>	<i>sd</i>		
Sturdy 2K	77.4	20.1	2.1	0.4	29.9	6.9	HARD	00-05-11-84-01
2137	57.2	19.3	2.2	0.4	32.3	8.1	MIXED	11-20-25-44-03
2180	66.4	21.7	2.1	0.4	30.3	7.5	HARD	05-09-21-65-01
Coronado	53.7	18.1	2.3	0.4	34.3	7.7	MIXED	12-22-33-33-03
Jagger	67.0	20.4	2.0	0.4	27.9	8.3	HARD	05-10-21-64-01
Ogallala	69.8	17.6	2.0	0.3	26.6	6.5	HARD	01-08-19-72-01
TAM 110	62.7	20.8	2.0	0.5	30.9	9.2	HARD	05-16-26-53-01
TAM 202	68.2	19.7	2.0	0.4	28.1	7.6	HARD	04-11-14-71-01
TAM 302	65.2	23.6	2.0	0.5	29.3	9.9	HARD	09-10-21-60-02
TAM 400	67.3	17.4	2.0	0.3	27.7	6.5	HARD	03-06-23-68-01
TAM W-101	66.7	14.6	2.4	0.3	38.1	6.8	HARD	01-07-25-67-01

^a Composite grain from Dallas, Era, Howe, and Prosper, Texas locations.

Table 10. Physical characteristics of grain of Sturdy 2K, Jagger, Ogallala and TAM W-101 from a composite grain sample^a in the North Texas Wheat Elite Trial in 2000-01. Data courtesy of the USDA/ARS Wheat Quality Lab, Manhattan, KS.

Cultivar			Kernel sizing ^b			Moisture		SKCS ^c avg kernel weight (mg)	SKCS avg kernel weight (sd)
	Test weight (lb/bu)	1000 kernel weight (g)	Large (%)	Medium (%)	Small (%)	Percent	sd		
Sturdy 2K	57.6	27.9	60.9	38.6	0.5	10.1	0.3	28.3	6.9
Jagger	58.3	28.9	68.8	30.1	1.1	10.1	0.3	30.5	7.9
Ogallala	58.9	25.1	49.8	48.1	2.0	10.2	0.3	26.3	6.7
TAM W-101	56.1	31.7	78.2	21.5	0.3	10.1	0.4	33.8	7.6

^a Composite grain from Dallas, Era, Howe, and Prosper, Texas locations.

^b For kernel sizing, L=large kernels (overs of Tyler#7); M=medium kernels (overs of Tyler#9); and S=small kernels (thrus of Tyler#9).

^c SKCS=Single kernel classification system.

Table 11. Chemical, milling, and mixograph data^a of grain of Sturdy 2K, Jagger, Ogallala and TAM W-101 from a composite grain sample^b in the North Texas Wheat Elite Trial in 2000-01. Data courtesy of the USDA/ARS Wheat Quality Lab, Manhattan, KS.

Cultivar	Hardness index ^c													
	SKCS				NIR	Wheat ^d		Milling ^e		Flour ^f			Mixograph ^g	
	Avg	sd	Class	Distribution		Ash	Protein	Yield	Score	Ash	Prot	CV	Abs	Tol
Sturdy 2K	80	16	HARD	01-03-04-92-01	60	1.34	11.0	69.1	82	0.39	9.8	81	59.6	3
Jagger	76	15	HARD	01-01-08-90-01	53	1.36	11.2	67.2	77	0.41	9.8	79	59.5	4
Ogallala	71	16	HARD	02-04-14-80-01	47	1.45	11.2	67.4	74	0.42	9.5	82	59.2	3
TAM W-101	61	15	HARD	04-09-34-53-01	45	1.51	10.6	66.1	82	0.41	9.2	80	58.8	3

^a Data expressed on a 14% moisture basis.

^b Composite grain from Dallas, Era, Howe, and Prosper, Texas locations.

^c Hardness determined by SKCS=Single kernel classification system, and by NIR. In both methods, the higher the number, the harder the grain.

^d Protein content determined by NIR and ash content by furnace method.

^e Milling is the % flour yield and the score is derived from test weight, flour yield, and ash and protein conversions. A score of at least 80 is desirable.

^f Color values (CV) were obtained by an Agtron Photoelectric Colorimeter with a modified method (AACC Method 14-30) using flour samples rather than using slurry samples with Agtron certified calibration disks. The higher the color value, the lighter (whiter) the flour color. It would be desirable to have flour color value of at least 80 for straight-grade flours.

^g Mixing tolerance was rated with numbers: 6 for outstanding; 5 for excellent; 4 for satisfactory; 2 for questionable; and 0 for unsatisfactory.

Table 12. Bread making data^a of grain of Sturdy 2K, Jagger, Ogallala and TAM W-101 from a composite grain sample^b in the North Texas Wheat Elite Trial in 2000-01. Data courtesy of the USDA/ARS Wheat Quality Lab, Manhattan, KS.

<i>Cultivar</i>	<i>Flour</i>		<i>Mix time^c</i>		<i>Dough</i>		<i>Crumb grain^d</i>	<i>Loaf volume^e</i>		
	<i>Protein %</i>	<i>Abs %</i>	<i>As is (min)</i>	<i>Corr (min)</i>	<i>Weight (g)</i>	<i>Proof height (cm)</i>		<i>As rec'd (cc)</i>	<i>Spec. volume (cc/g)</i>	<i>Regres. (cc/%P)</i>
Sturdy 2K	9.8	58.3	3.50	2.97	168.9	6.5	3.8	770	5.2	68
Jagger	9.8	59.2	4.50	3.29	168.5	7.2	3.2	830	5.6	76
Ogallala	9.5	59.3	5.00	3.51	168.5	6.9	3.2	825	5.6	78
TAM W-101	9.2	59.1	4.50	3.00	168.0	7.0	3.2	810	5.5	79

^a Data expressed on a 14% moisture basis.

^b Composite grain from Dallas, Era, Howe, and Prosper, Texas locations.

^c Mixing times (MT) for samples having less than 12% protein were corrected (Corr.) to 12% protein. MT < 2.5: unsatisfactorily short; 2.5 < MT < 3.5: medium with more stability; 5.5 < MT < 7.5: long and dough could become bucky; MT > 7.5: unsatisfactorily long.

^d Crumb grain was rated with numbers: 6 for outstanding; 5 for excellent; 4 for satisfactory; 2 for questionable; and 0 for unsatisfactory.

^e Spec. Volume = specific volume (loaf volume/loaf weight). Baking industry desires about 6 for Spec. Volume. Regression is the change in loaf volume (cc) per unit percentage point of flour protein content.

Table 13. Physical characteristics of grain of Sturdy 2K, 2137, Coronado, and Jagger from the Hard Wheat Trial in Plymouth, NC in 2001-02. Data courtesy of the USDA/ARS Wheat Quality Lab, Manhattan, KS.

<i>Cultivar</i>			<i>Kernel sizing</i>			<i>Moisture</i>		<i>SKCS^a avg kernel weight (mg)</i>	<i>SKCS avg kernel weight (sd)</i>
	<i>Test weight (lb/bu)</i>	<i>1000 kernel weight (g)</i>	<i>Large (%)</i>	<i>Medium (%)</i>	<i>Small (%)</i>	<i>Percent</i>	<i>sd</i>		
Sturdy 2K	57.9	na ^b	na	na	na	13.7	0.3	24.0	6.3
2137	60.7	na	na	na	na	13.1	0.3	29.6	6.6
Coronado	58.2	na	na	na	na	13.8	0.3	26.8	7.6
Jagger	55.9	na	na	na	na	113.2	0.3	22.1	5.7

^a SKCS=Single kernel classification system.

^b Data not available.

Table 14. Chemical, milling, and mixograph data^a of grain of Sturdy 2K, 2137, Coronado, and Jagger from the Hard Wheat Trial in Plymouth, NC in 2001-02. Data courtesy of the USDA/ARS Wheat Quality Lab, Manhattan, KS.

Cultivar	Hardness index ^b													
	SKCS				NIR	Wheat ^c		Milling ^d		Flour			Mixograph ^e	
	Avg	sd	Class	Distribution		Ash	Protein	Yield	Score	Ash	Prot	CV	Abs	Tol
Sturdy 2K	91	16	HARD	01-01-01-97-01	74	na ^f	12.0	67.4	na	0.42	10.7	na	60.8	4
2137	80	16	HARD	01-02-08-89-01	70	na	11.0	69.0	na	0.40	9.4	na	58.7	4
Coronado	75	18	HARD	00-05-12-83-01	59	na	12.8	69.0	na	0.44	11.4	na	62.0	4
Jagger	82	16	HARD	00-02-03-95-01	63	na	13.9	66.2	na	0.43	12.1	na	63.0	4

^a Data expressed on a 14% moisture basis.

^b Hardness determined by SKCS=Single kernel classification system, and by NIR. In both methods, the higher the number, the harder the grain.

^c Protein content determined by NIR.

^d Milling yield is the % flour yield.

^e Mixing tolerance was rated with numbers: 6 for outstanding; 5 for excellent; 4 for satisfactory; 2 for questionable; and 0 for unsatisfactory.

^f Data not available.

Table 15. Bread making data^a of grain of Sturdy 2K, 2137, Coronado, and Jagger from the Hard Wheat Trial in Plymouth, NC in 2001-02. Data courtesy of the USDA/ARS Wheat Quality Lab, Manhattan, KS.

Cultivar	Flour		Mix time ^b		Dough		Crumb grain ^c	Loaf volume ^d		
	Protein %	Abs %	As is (min)	Corr (min)	Weight (g)	Proof height (cm)		As rec'd (cc)	Spec. volume (cc/g)	Regres. (cc/%P)
Sturdy 2K	10.7	60.8	3.38	3.29	170.9	7.0	4.0	805	5.9	65
2137	9.4	58.7	3.00	2.54	168.2	6.8	3.2	725	4.9	64
Coronado	11.4	62.0	4.00	3.73	170.9	7.3	4.5	900	6.0	71
Jagger	12.1	63.0	4.00	4.00	171.9	7.7	4.0	1000	6.0	77

^a Data expressed on a 14% moisture basis.

^b Mixing times (MT) for samples having less than 12% protein were corrected (Corr.) to 12% protein. MT < 2.5: unsatisfactorily short; 2.5 < MT < 3.5: medium with more stability; 5.5 < MT < 7.5: long and dough could become bucky; MT > 7.5: unsatisfactorily long.

^c Crumb grain was rated with numbers: 6 for outstanding; 5 for excellent; 4 for satisfactory; 2 for questionable; and 0 for unsatisfactory.

^d Spec. Volume = specific volume (loaf volume/loaf weight). Baking industry desires about 6 for Spec. Volume. Regression is the change in loaf volume (cc) per unit percentage point of flour protein content.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE**EXHIBIT E**
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). The information is held confidential until the certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) Texas Agricultural Experiment Station	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER TX391-56-D1-23-D19-7; D19-7	3. VARIETY NAME Sturdy 2K
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country) Office of the Director, TAES 2147 TAMU College Station, TX 77843-2147	5. TELEPHONE (Include area code) (979) 845-4747	6. FAX (Include area code) (979) 458-4765
	7. PVPO NUMBER 200500013	

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. If no, please explain.

☒ YES☐ NO

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? If no, give name of country.

☒ YES☐ NO

10. Is the applicant the original owner?

☒ YES☐ NOIf no, please answer one of the following:

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?

☐ YES☐ NO

If no, give name of country

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?

☐ YES☐ NO

If no, give name of country

11. Additional explanation on ownership (Trace ownership from original breeder to current owner. Use the reverse for extra space if needed):

TAES policy and handbook manual provide that all germplasm and varieties developed by its employees in the course of their duties are owned by TAES. A copy of this policy is provided for your records.

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 0.1 hour per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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